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(54) Abstract Title
Method and apparatus for colour sample identification and display

(57) A method of generating a set of colour data, such as hue, tone and light density, from a scanned sample, generating new values from the original values based on a relationship between the two sets of data. The first and second sets of data can be displayed to show a virtual image. The apparatus utilises a sample locating means, a scanner, a processor to generate new values from the scanner output and a display or transmission means.

An example is given using a scanned sample of curtain fabric, the values of which could be converted into a Pantone (RTM) format for use in a colour brochure.

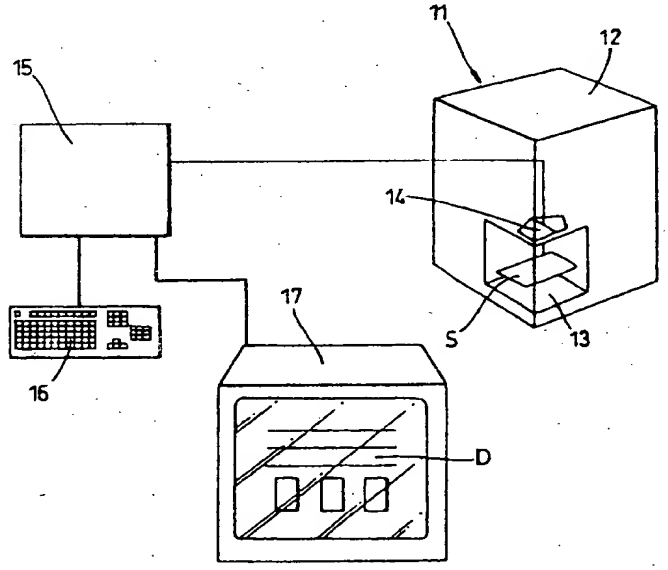

Fig. 1

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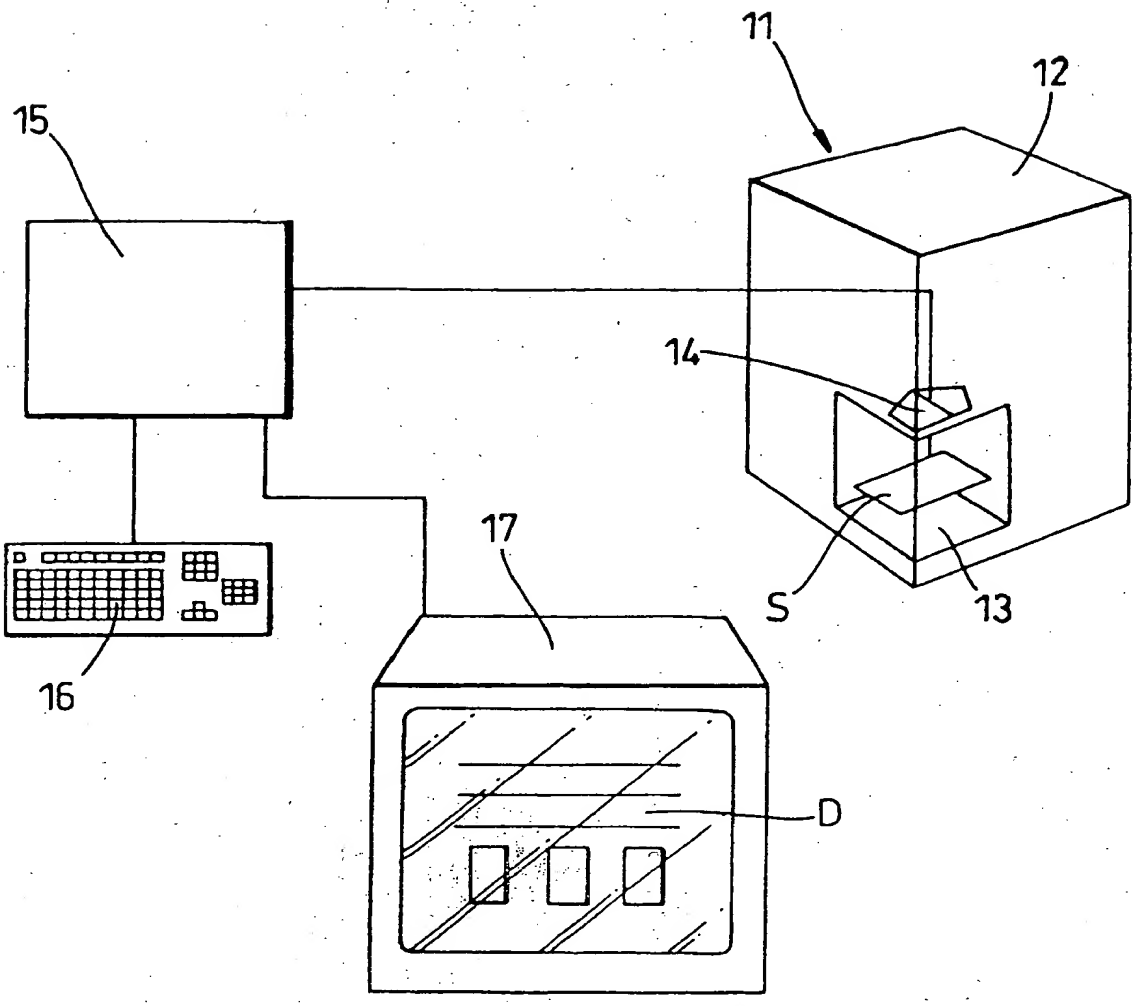

Fig. 1

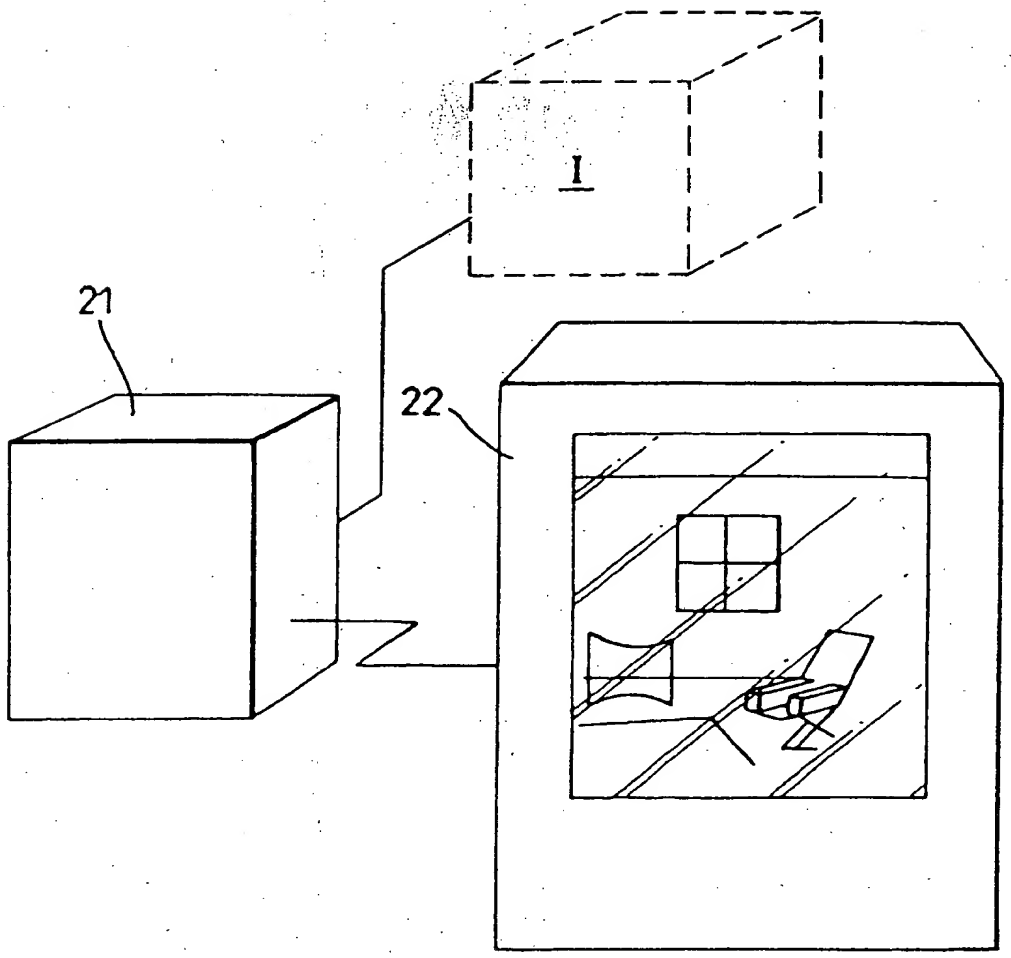

Fig. 2

IDENTIFICATION METHOD AND APPARATUS

This invention relates to an identification method and apparatus.

In modern industries it is known to make use of colour standards and scales to ensure that the colour or colours of an item can be accurately identified. Typically this enables a colour of an article to be defined so as to be able to reproduce the colour to a particular level of accuracy in another context say for matching one colour scale for carpet with another colour scale say for curtains.

The use of computers in the production of printed, dyed and photographic products and reproduction has lead to a need for accurate colour reproduction. The steps involved in a change from design to finished product has lead to a need for accurate colour matching. Typically colour matching arises in connection with the use of colour monitors which provide colour images which need to be translated from what is shown on the screen into printed or dyed end products. When a printed reproduction of an image on a screen is required the colours are converted from the red, green, blue ('RGB') colour spectrum of the screen to a cyan, magenta, yellow and black ('CMYK') colour spectrum used in operating a printer. Such a conversion step is carried out during the printing process but the conversion does not necessarily take into account, to an acceptable extent, the different colours a screen and a printer can display and as a result the image produced from a colour printer can differ significantly from an original image on the screen. Software algorithms exist for improved conversion accuracy from RGB to CMYK spectra. Research to enable a sufficiently accurate definition of the colour of an original piece of material (such as artwork, photograph, fabric or textile), to be converted into an end product (such as magazine page, engraving, curtaining, dyestuff) has resulted in a number of commercial available products for colour matching. These include: 'PANTONE' (RTM) typically for reproduction of colour in relation to documents, computers and in communications contexts; 'CHROMATONE' (RTM) typically for textiles; and 'DULUX' typically for paints. They all involve identifying an initial colour so in subsequent production, reproduction or information transmission steps an original colour can be

defined in terms of a number of parameters which can be subsequently used in reproduction processes, which can include digital processing, as well as manufacturing processes such as printing, textile dyeing or colouring of plastics material involving polymerisation.

Colour is frequently defined in terms of three parameters: hue, tone (lightness/darkness) and intensity.

According to a first aspect of the present invention the is provided a method of generating colour based information originating from a sample comprising the steps of:

1 putting the sample into a condition where it can be scanned to provide consistent colour and light information in the form of parameters (such as information relating to hue, tone and light intensity);

2 scanning the sample to establish first value/s of the required parameter/s according to a given first range of such parameters;

3 generating from the first value/s second value/s of the parameter/s lying in a second range of such parameters either on the basis of a one-to-one relationship between at least a part of the first range and the second range or on the basis of some other relationship or relationships between the first and second range;

4 displaying some or all of the first value/s or the second value/s or of functions of the first or second values or combinations of the first and second values or of functions thereof either directly or in the form of a virtual or other image.

According to a first preferred version of the first aspect of the present invention there is provided a further generating step involving the generation of at least third value/s of the parameter/s in a third range of such parameters either on the basis of a one to one relationship between the first and/or second range and the third range or on the basis of some other relationship between the first and/or the second range and displaying some or other of the first, second, third values or functions of these or combinations of the values

According to a second aspect of the present invention there is provided an apparatus for providing information relating to a sample comprising:

a locating means adapted to locate a sample from which information is required;

a scanner mounted relative to the locating means and adapted so as to be able to scan a sample located by the locating means and to provide as output information relating to the colour of the located sample;

a processor adapted to receive output information from the scanner in relation to a first range of such parameters; to generate second value/s of the parameter/s in terms of a second range of such parameters either on the basis of a one-to-one relationship between the first range and the second range or on the basis of some other relationship or relationships between the first and second range; and

display or transmission means whereby some or all of the first values or the second values or functions of the first or second values or combinations of the first and second values or of functions thereof can be displayed or transmitted either as information or in the form of a virtual or other image.

According to a first preferred version of the second aspect of the present invention the processor is further adapted to generate of at least third value/s of the parameter/s in terms of a third range of such parameters either on the basis of a one-to-one relationship between the first and/or second range and the third range or on the basis of some other relationship or relationships between the first and/or the second range and the display or transmission means serve to displaying or transmit some or all of the first, second, or third values or of functions of the first second or third values or combinations of the first second or third values or functions thereof can be displayed or transmitted either as information or in the form of a virtual or other image.

According to a third aspect of the present invention there is provided a display unit having a display screen and adapted to display on a first region or regions of the screen a first image and on a second region or regions of the screen the information displayed by or transmitted from the apparatus according to the second aspect of the present invention or the first preferred version thereof.

The matter of accurate identification and reproduction of colour is a particular problem in retail trades where a need often arises for sample provided by a customer, say for a carpet, needs to be related to other textiles, such as curtains or relating to furniture or to other materials such as wall coverings or decorations and not merely from the point of view of direct colour matching but also in relation to at least one contrasting colour.

Exemplary embodiments of the invention will now be described with reference to the accompanying block diagrams of colour information handling units of which:
Figure 1 is of a basic unit and
Figure 2 is of a more elaborate unit for use in subjective consideration of a product in an environment.

Figure 1

A colour information handling unit 11 comprises a housing 12 with a chamber 13 for receiving a sample S about which colour information is required to enable the colour to be identified for use in connection with a later product. Scanner 14 for measuring light reflectance is mounted to sweep the chamber 13 able to scan a sample located by the locating means and to provide as output information relating to the colour of the located sample. If necessary the sample can be combined with a mounting means which serves to render the scanning information more consistent or reproducible.

In the present case the sample is assumed to be a piece of curtain fabric having a colour which the customer wishes to relate to carpet and a wall paper. The output of the scanner 14 is fed to a computer 15 which is also connected to a keyboard 16 and video display unit 17. The computer 15 contains a working memory adapted to receive output information from the scanner 14 in relation to a first scale of such parameters (say in light reflectance scale). The computer 15 also contains in its memory a second scale of such parameters (say calibrated on a Chromatone (RTM) scale). On the input of the reflectance information in terms of the first scale of parameters corresponding values are computed on the second scale. The relationship between the first and second scale can be a simple one-to-one

relationship or some other more complex relationship. If necessary the program can call for further information, which can be entered by way of the keyboard or from existing stored data to facilitate the required output.

Having completed the necessary computation the results are shown as a display D in appropriate form on the video display unit 18. The form of the display D depends on the eventual function of the computation as will be referred to later in connection with Figure 2. Typically given that the first scale defines parameters in terms of a reflectance colour scale and the second scale identifies the appropriate parameters for textile colouring then a further processing step by the computer can provide further information such as, for example, to the availability and stock position in a central carpet warehouse or the location of the selected textile. If necessary the program can be used for initiating further more detailed action such as the preparation and transmission of an order or other instruction relating to the amounts, material and dates to be met.

Two colour scales are here referred to (for a reflectance colour scale and a textile scale). Further or alternative scales can also be included such as Pantone (RTM) for providing for the appropriate colour printing of brochures or advertising material so as to provide for an accurate colour reproduction in a brochure or catalogue or for a particular type of display or television system.

Figure 2

This shows an development of the system described in connection with Figure 1. The unit of Figure 1 is shown as outline I.

A carpet showroom computer unit 21 is linked to a video display unit ('VDU') 22 and to the unit I. The unit 21 provides for the VDU 22 to display a variety of room settings in colour except for painted or furnishing items such as walls, curtains, carpet and upholstery which are shown in black or white outline. Given the insertion of a customers sample in the unit I as described in connection with Figure 1 the Unit I can be used to transmit to the unit 21 colour parameters to enable the relevant black or white outline to

be appropriately coloured with an accurate representation of the colour involved. In this way a customer can be provided with an accurate representation of a possible layout for the virtual room on display.

If necessary the computer unit 21, or unit I, can contain a program including a colour circle and to provide for a selected colour to be related to another colour or other colours on the colour circle. In this way complementary or other colours or finishes relating to a selected colour can be demonstrated. The programs involved can also be readily adopted to provide for the effect of various types of lighting such a natural or artificial filament or discharge lighting, or combinations of these, and for the effect of changes in lighting at different times of the day.

The invention provides a method and means for readily establishing requirements that can be identified in terms of parameters in one colour scale to be readily transcribed into those of another such scale or scales for a range of different product types which need to be reconciled with one another. This can be particularly significant in a context where subjective judgement arises in connection with what can be a visually complex display under a range of lighting conditions.

The exemplary embodiment describes an application of the invention in terms of colour parameters (broadly hue, tone (lightness/darkness) and intensity. For practical purpose other parameters may be added to these for the purpose of ensuring that other associated features relating to the overall appearance of a coloured article are transmitted. Typically an appearance can be metallic, matte or glossy, smooth or fibrous or woven.

CLAIMS

1 A method of generating colour based information originating from a sample comprising the steps of:

putting the sample into a condition where it can be scanned to provide consistent colour and light information in the form of parameters (such as information relating to hue, tone and light intensity);

scanning the sample to establish first value/s of the required parameter/s according to a given first range of such parameters;

generating from the first value/s second value/s of the parameter/s lying in a second range of such parameters either on the basis of a one-to-one relationship between at least a part of the first range and the second range or on the basis of some other relationship or relationships between the first and second range;

displaying some or all of the first value/s or the second value/s or of functions of the first or second values or combinations of the first and second values or of functions thereof either directly or in the form of a virtual or other image.

2 A method as claimed in Claim 1 including an additional generating step involving the generation of at least third value/s of the parameter/s in a third range of such parameters either on the basis of a one to one relationship between the first and/or second range and the third range or on the basis of some other relationship between the first and/or the second range and displaying some or other of the first, second, third values or functions of these or combinations of the values

3 An apparatus for providing information relating to a sample comprising:

a locating means adapted to locate a sample from which information is required;

a scanner mounted relative to the locating means and adapted so as to be able to scan a sample located by the locating means and to provide as output information relating to the colour of the located sample;

a processor adapted to receive output information from the scanner in relation to a first range of such parameters; to generate second value/s of the parameter/s in terms of a second range of such parameters either on the basis of a one-to-one relationship between the first range and the second range or on the basis of some other relationship or relationships between the first and second range; and

display or transmission means whereby some or all of the first values or the second values or functions of the first or second values or combinations of the first and second values or of functions thereof can be displayed or transmitted either as information or in the form of a virtual or other image.

4 Apparatus as claimed in Claim 3 wherein the processor is further adapted to generate of at least third value/s of the parameter/s in terms of a third range of such parameters either on the basis of a one-to-one relationship between the first and/or second range and the third range or on the basis of some other relationship or relationships between the first and/or the second range and the display or transmission means serve to displaying or transmit some or all of the first, second, or third values or of functions of the first second or third values or combinations of the first second or third values or functions thereof can be displayed or transmitted either as information or in the form of a virtual or other image.

5 A display unit having a display screen and adapted to display on a first region or regions of the screen a first image and on a second region or regions of the screen the information displayed by or transmitted from apparatus as claimed in Claim 3 or Claim 4.

5 A method of generating colour based information originating from a sample as hereinbefore described with reference to the accompanying drawings.

6 Apparatus for providing information relating to a sample as hereinbefore described with reference to the accompanying drawings.

Application No: GB 9901960.6 9 **Examiner:** Guy Tucker
Claims searched: 1 - 7 **Date of search:** 14 June 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): G1A (CDC, CDX)

Int Cl (Ed.7): G01N21/25; G01J3/46, 3/50, 3/51, 3/52

Other: Online: EPODOC, JAPIO, WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	US 5751829 A	(RINGLAND et al.) see in particular the abstract, col 6 lines 39 - 50, col 9 lines 24 - 56 & col 19 line 64 - col 20 line 14	1 - 5
X	US 5680327 A	(COOK et al.) see abstract and col 1 - 8	1, 3 & 5 at least
X	US 4931929 A	(SHERMAN) see abstract, col 8 line 58 - col 14 line 9	1, 3 & 5 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

on a scale extending between mat or glossy, between metallic or dull, between coarse or fine weave or between limiting values of some other visually significant attribute or attributes.

4 Apparatus for undertaking the method as claimed in any preceding claim of the first step characterised by:
a locating means adapted to locate the first article;
a scanner mounted relative to the locating means and adapted to scan a first article and to provide the derived output information;
a processing means adapted to receive the derived information and to relate the established parameter or parameters to one or more ranges of such parameters either by direct comparison with a physical sample or with entries in a range of such parameters held as a data base to identify the required parameter or parameters of the second article as aforesaid.

5 Apparatus as claimed in Claim 4 characterised in that the processing means involves the Chromatone (RTM) colour scale whether in terms of physical samples from a range of such or in the form of a data base.